PHYSICAL DEFECTS IN THE MENTALLY-RETARDED SCHOOL CHILDREN*

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Los Angeles

DISCUSSION *by Ellen S. Stadtmuller, M.D., San Francisco; Sven Lokrantz, M.D., Los Angeles; A. J. Rosanoff, M.D., Los Angeles.*

THE problem of physical defects in the mentally-retarded school children has been studied in this country and abroad. The most extensive studies have been made in England by such authorities as Tredgold, English, and Burt. They state that out of 150,000 children examined, 0.5 per cent to 1 per cent were mentally defective. The figure in the United States, according to statistics, is 2 per cent, and in Los Angeles about 1.9 per cent. It is of interest to note that there are more mentally-deficient boys than girls, the proportion given being three to two.

There are more mentally-deficient children in the large cities than in the smaller communities.

Mentally-defectives are just as prevalent among the upper as the lower classes of society.

ETIOLOGIC FACTORS

The factors responsible for the mental deficiency may be traced to the prenatal and postnatal life of the child. They may be of a hereditary, congenital or acquired origin.

The origin is *hereditary* in cases of deficiency in the male or female germ-cells of the parents—the carriers of true heredity.

The reasons for the deficiency are not always clear. Some authorities believe that imperfect contraceptive methods, which only damage, but do not kill the spermatozoa and permit them to penetrate into the uterus, may be responsible for a defective offspring. The advanced age of the parents, particularly of the mother, is considered to be an important factor in the deficient structure of the germ-cells.

The origin is considered to be *congenital,* if mental deficiency is caused by illnesses, injuries, or poisons acting on the fetus in utero, like congenital syphilis in the mother, lead-poisoning, alcohol, or an unsuccessful abortion.

The origin may be considered of an *acquired* nature when mental deficiency results from birth injuries, or injuries and illness of the brain received after birth. The higher incidence of mental deficiency in boys is due to the fact, stated by many, that the male fetuses are more vulnerable than the female—both in a general way and with respect to the organs of intellectual function.

Are any congenital or acquired physical disorders, such as glandular disturbances, congenital syphilis, or others responsible for mental deficiency?

Glandular disorders are frequently found in mentally-retarded children, but they may not always be responsible for the retardation.

In a study of 317 mentally-defective children made recently by Dr. M. Gordon and Dr. L. Ruskin, of the Department of Pediatrics in Long Island College, it has been found that 155 had endocrine symptoms and 162 did not have any. In another study, made by the same authors on 958 children with mental defects, 529 had glandular defects and 429 were free of them.

Opinions differ as to the frequency of the occurrence of glandular defects in the mentally-deficient, and statistics vary from 2.4 per cent to 6.2 per cent.

It may be of interest to note that, in the above-mentioned studies, the nonglandular cases had a lower I.Q. than those which showed a definite disturbance of the endocrine glands. There are three probabilities, according to Gordon and Ruskin, in the relationship between mental deficiency and the disturbance of the glands:

1. Either the mental status is due to the endocrine disorder,
2. Or the mental status is the result of an unrelated, nonendocrine cause,
3. Or the mental retardation and the endocrine disturbance are both due to a third common, genetic cause—congenital, or acquired.

Is congenital syphilis a frequent cause of mental deficiency?

Authors disagree upon this also. Professor Gött, of the University of Bonn, Germany, states that many feeble-minded children show evidence of congenital syphilis, while others have a suggestive history, and he states further that, although general statistics vary, he found that in a large percentage the Wassermann reaction is positive.

Kropelin of Germany assumes a syphilitic background in 33 per cent of his cases. He states, as an example, the frequency of encephalitis in the newborn, resulting from syphilis in the mother during pregnancy.

The English and American authors, on the other hand, believe that no unduly *large* proportion of mental defectives are subject to congenital syphilis, or show a positive Wassermann reaction, and that mental deficiency constitutes no proof that the latter is due to the former.

Diseased tonsils, deafness, and blindness tend to mask the intelligence and reduce its effectiveness, but do not cause mental deficiency. They may retard the child's ultimate development by an equivalent of six to twelve months' progress, but are easily remedied.

Epilepsy, on the other hand, gradually leads to the deterioration of the brain and to a defective intellect.

Hereditary causes are responsible for a much larger portion of mental defects than are the congenital or acquired.

The Committee on Mental Deficiency in London, England, in a report to the British Medical Association in 1932, states that 70 per cent of all mental defects are inherited, while 30 per cent are acquired, and that in a large majority heredity furnishes the *material,* and environment shapes it and uses it. This statement does not imply that the majority of mentally-deficient children are born of mentally-deficient parents.

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* A school physician's viewpoint.

Read before the Section of Education of Exceptional Children of the Los Angeles Board of Education on May 11, 1937.

In a study made among the London school children, it was found that barely 6 per cent of the mentally-defective children had defective parents, but 38 per cent had at least one parent definitely dull, and 12 per cent had one parent who suffered from epilepsy.

A seemingly sporadic case in a family is not rare, but a thorough study may trace it to a neurotic or unstable relative of tainted stock.

In other words, mental deficiency is usually inherited as a recessive characteristic, but in certain cases may act as dominant.

The inheritance takes the form of a neurotic diathesis, or an innate predisposition to a neurotic weakness. No clean application of the Mendelian law to the inheritance of mental defects has been made. But, as a rule, feeble-minded parents are usually apt to produce feeble-minded children, and intelligent parents are generally apt to bring intelligent offspring into the world. This rule has many exceptions. If there is one feeble-minded child in the family, it is quite possible that there may be others.

PHYSICAL STIGMATA

Many mentally-defective children have quite a normal physical appearance and cannot, by casual inspection, be singled out among other children as abnormal.

The majority, however, show more or less evident stigmata of degeneration. Asymetry or unusually large or small size of the head; deformities of the external ear, or its complete absence; an epicantic fold from below the eyebrows continuing around the internal angle of the eyes; differently-colored irises, irregular pupils, a squint; a flattened, depressed nose, large, fleshy nostrils; coarse, prominent lips, a heavy, flabby, open mouth, with irregular, protruding teeth are the prominent features in extreme cases. Webbed fingers and deformed toes are not rare. The skin is coarse and hairy, or abnormally hairless. The stature is usually small with excessive adiposity, gigantism may be present in other cases. The posture is poor, the gait is clumsy and ungraceful, the speech may be defective; many are nervous, jerky and subject to choreiform movements. Few normal individuals are without at least one of these stigmata, but the coexistence of several in the same individual indicates abnormality.

Anatomical studies of the brain in the mentally-retarded show an imperfect development or an irregular arrangement of the brain cells. Very often there is found a deficiency in the numbers of the cells and a poorly-developed, capillary system. These findings may be responsible for the inefficient function of the brain.

TYPES

There are several distinct types among the mentally-retarded children. Of these the Mongoloid has the most conspicuous appearance and facial characteristics responsible for the name. According to Crookshank, this type is not found among negroes and is rare among Jews. The true ethiology of these cases is unknown. They are frequently born to mothers past forty years of age, and resemble other Mongoloids much more than members of their own family.

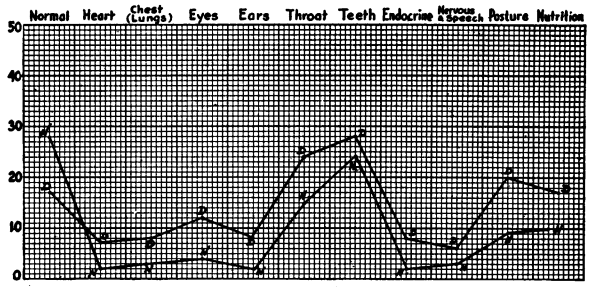

Chart 1.—A comparative study of physical defects in children in four development schools (Curve D) and in four normal schools (Curve N) in Los Angeles.

Another type frequently found among the mentally-defective children is the cretin—short stocky, dull—the subject of a disturbance in the function of the thyroid gland and the most amenable to medical treatment.

The third, easily-distinguishable type is the miscrocephalic, with his small head, fine features, spastic extremities, nervousness and squint.

Many children do not present clear-cut types, but attract attention by the lifeless indifference of their facial expression.

OTHER FACTORS

The mentally-defective children have a prevalence of physical defects and a lower vitality when compared with the normal.

Professor Eugene Schlezinger, of Zurich, Switzerland, finds, as the result of a study on 712 children made in 1936, that the majority of bright children have a very good physique, while the majority of dull children have a poor physique, but not always. Sometimes an antagonistic relationship exists, as if nature tried to produce equality by giving the mentally-weak a strong body, and vice versa.

Professor Otto Schneider, of Berlin, Germany, in an article in Gesundheit und Erziehung, of January, 1934, states that in a comparative study made on children in normal and development schools, he found defects in 63.1 per cent of boys in the development schools against 42.4 per cent of boys in the normal schools, and in 42.8 per cent of girls in the development schools against 26.1 per cent in the normal.

Vitality and resistance to diseases is also much lower in the mentally-retarded. Their mortality is from three to six times greater. Congenital heart disease and tuberculosis are the most frequent causes of early death.

According to Maltzberg, 25 per cent of mentally-defective children die between the ages of four and six; 50 per cent die between the ages of thirteen to seventeen, and 75 per cent die before the age of thirty.

The reason for such high mortality, according to Walter Fernold, is that the feeble-minded are also feeble-bodied. A study made in his school shows that four out of five children have defective teeth and tonsils; one out of four has defective vision; one in six has a defective heart and circulation, and one in seven has neurological defects.

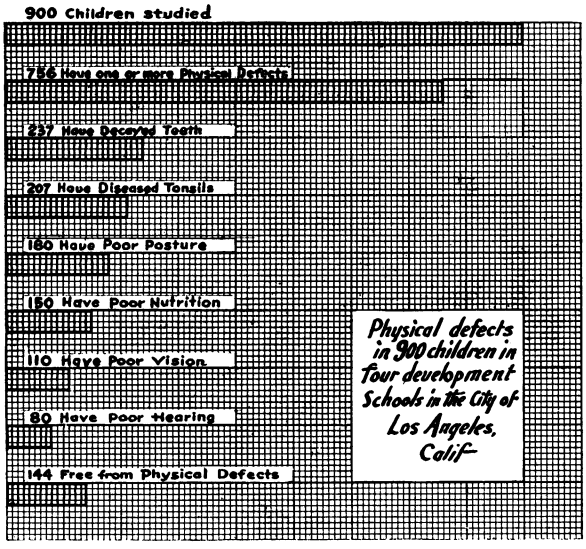

Chart 2.—Physical defects in 900 children in four development schools in the city of Los Angeles.

Doctor Lapage found, in his study, that 90.5 per cent of the mentally-retarded children had physical defects of some kind, and that 25 per cent had triple defects and a high mortality.

One of the most prevalent defects is poor eyesight, as caused by a squint, myopia, hyperopia and astigmatism. Defects in hearing are also numerous and frequently remain unrecognized for a long time, particularly in cases where deafness is limited to one end of the tonal scale.

Many children have congenital heart disease, with poor circulation and a tendency to a catarrh of the respiratory tract. They develop diseased tonsils, large adenoids, coryza bronchitis and a great predisposition toward tuberculosis.

Anomalies of the palate are frequent. A high saddle or V-shaped palate is found in from 61.7 per cent to 80 per cent of the mentally-dull children.

A good set of teeth is rare. The teeth usually are late to appear, are malformed, unhealthy, and decay early. The chewing of the food is unsatisfactory, and poor digestion, poor assimilation and malnutrition follow.

The function of the glands of internal secretion is disturbed in many cases, with the consequence of faulty metabolism.

PROPHYLAXIS

Can anything be done to prevent mental deficiency in children?

So far very few measures are known to be useful, and these are applied in this country and abroad. Sterilization of the known mentally-deficient will prevent this group from bringing forth children. But, according to the Burt certifiable defective form, these are but the fringe of a much larger portion of the population which includes the dull, the backward, the unemployable, the habitually delinquent—all of whom are subnormal in one direction or in another. It is debatable, as yet, whether the sterilization of such a large group is practical.

Segregation of smaller groups may prove successful, as substantiated by a very interesting incident described by David Starr Jordan in the *Training School Bulletin* of October, 1915.

In 1897, while visiting the Valley of Aosta, he saw hundreds of cretins—the severe military selection of this region having removed the healthy males, left the goitrous, and cretins to carry on, and they multiplied greatly. In 1910, when he visited the valley again, he found that the cretins had disappeared. By law they had been segregated and sent to an asylum, thereby being prevented from marrying.

Congenital syphilis as a factor of mental deficiency may be prevented by early and intensive treatment of the mother. Proper prenatal care and proper obstetrical procedures may prevent some deformities and birth injuries. Proper care of the infant may diminish the incidence of infectious diseases and accidents, so often responsible for acquired mental deficiency.

Proper birth-control method will, to a great extent, control the propagation of the unfit. Prevention is always the ideal procedure in medicine, but when it fails, the second best is cure.

PROGNOSIS AND TREATMENT

The essence of mental deficiency is that it is incurable.

We can no longer hope that the removal of the tonsils, the repair of the teeth, the provision of glasses and gland therapy will do much to lessen the number that is mentally backward. However, as a result of care, better tools will be used by those whose mental capacity is limited, and who need this help because of their affliction. There can be no doubt that the mentally-defective, just as the normal child, possesses potentialities and is capable of development, though at a slower rate of speed. For a long time it may be impossible to detect any signs of progress; then, suddenly, it may appear and develop.

The correction of physical defects in mentally-deficient children should be considered, first, as an essential prelude, and then as an accompaniment to the training of the mind. Drugs have no direct influence on the improvement of the mind in the majority of cases, with the exception of thyroid extract, known to be definitely helpful in cases of cretinism. The other glandular preparations so far do not show any beneficial effects on mentality. Antisyphilitic treatment will prevent the progress of the disease, but will not correct the damage existing. Operations are absolutely unjustified, as are also manipulations of the chiropractors or ostheopaths.

The removal of the physical defects, placement of the children in open-air rooms, milk, cod-liver oil, proper physical training and a large amount of rest will tend to produce a healthier body and thereby may also improve, if not the health, then perhaps the function of the mind.

This program is being tried at the present time in Germany with beneficial results. Doctor Schneider, in his preliminary report, states that the children who were treated according to the above-mentioned program were found, upon reëxamination, to be taller, to have gained weight, to have fewer infectious diseases, and a better attendance in school.

With these remarks embracing the etiology, clinical findings and treatment of mentally-deficient children, I will conclude the review of what is being thought and done for these children by the medical profession in this country and abroad.

FOUR LOS ANGELES DEVELOPMENT SCHOOLS

Within the past two months I have made a study of the health situation in nine hundred children in four development schools in Los Angeles.

Each one of these schools is representative of a more or less definite group, or combination of groups, of the Los Angeles population, and the children in all four of these schools are representative of any group which includes negroes, Mongolians, Mexicans, and Caucasians; the latter including Italians, French, Slavs, Jews and native sons and daughters of Nordic descent. These nine hundred children represent about 25 per cent of the development school population of Los Angeles. These four schools I have compared to four schools for the normal children in their respective neighborhoods. The four elementary schools have about 2700 children. Five of these schools have been under my supervision for several years, and I am well acquainted with the children who attend them. The information about the other three schools I received from health cards and from most valuable additional comments graciously given to me by their principals.

DATA CONCERNING NINE HUNDRED CHILDREN

In reviewing the material which I have collected for my study, I came across many rather interesting facts. I also found that there is a larger percentage of boys in the development schools, namely that there were 528 boys against only 372 girls among the nine hundred children studied, a proportion of four to three against three to two reported in the literature. Whether this happened because the male fetuses were more susceptible to injury and actually were injured, would be difficult to prove. For lack of time I did not make a thorough study of the heredity in each child in the development group, but one may infer that the hereditary factor of mental retardation was frequently present, since I found that 169 families, or 20 per cent, have more than one child in a development school. Many families have three children. Several have four and one family has five members in the same development school. One of these children is a niece to the other four. Many children have a father or mother, or both parents, who have attended development schools, sometimes the same school where their children are at present. Children from all strata of society can be found in these schools—Americans and foreigners of all nationalities. Mexicans prevail, no doubt for the simple reason that Los Angeles ranks second in the world in regard to its Mexican population, Mexico City being first.

All races and all school ages are represented.

Most of the children come from poor families, but many come from the middle class and a few from the rich. The small number from the well-to-do families is due to the fact that many of the parents who can pay prefer private training.

In September, 1936, 2,936 children were enrolled in the development schools against 156,992 in the elementary schools in Los Angeles, which makes the percentage of mentally-deficient children in the public schools equal to 1.9 per cent against 2 per cent for the United States.

The average daily attendance of the children in the development schools is lower than in the elementary schools. The normal children have a better attendance partly, perhaps, because they are more interested in their work, but mainly because the majority enjoy better health and are less susceptible to minor illness, so prevalent among the mentally-retarded. The greater susceptibility of the mentally-retarded is due to a poorer physical condition, as it may be seen from charts which I have made following my comparative study.

The curves on the chart of the final comparative study show that a higher percentage of children in the development schools suffer from each one of the eleven defects most frequently found during the physical examination. The same chart also shows that fewer children in the development schools are entirely free from defects. The differences, though, are not as high as one might expect and, I believe, for the following two reasons: First, because the curve of the physical defects in the normal children is too high, the number of decayed teeth and diseased tonsils is appalling. The second reason lies in the fact that the retarded children, because of their helplessness and the inadequacy of their parents, receive more medical care through the schools. They have comparatively more nurse service, they are usually transported to the clinics, or have the clinics brought to them in the form of the "healthmobile."

ASSOCIATED PHYSICAL DEFECTS

It is encouraging to find that the physical condition of the children in our development schools is not any worse, although it is far from being adequate. I found, among the nine hundred children studied, that 756 have physical defects, 234 have decayed teeth, 207 have diseased tonsils, 180 have poor posture, 150 have poor nutrition, 110 have poor vision, 80 are known to have poor hearing—the actual number of those who are deaf is probably much higher.

Each one of these defects will handicap a normal or even a bright child, and certainly is no asset to the mentally-deficient. There can be no doubt that the mentally-deficient, if left without training, will grow up to become a burden to society. To prevent such an occurrence, development schools, where education is offered to these children, have been organized. But how much can the child with limited mental capacity profit from this offer when he also happens to be partially blind or deaf; has a nasal obstruction with difficulty in breathing; has weak lungs, a bad heart and poor circulation; is malnourished, nervous; has decayed teeth with digestive disturbances, poor assimilation and a poor metabolism?

In order to help him receive whatever knowledge and training his mentality is capable of absorbing, we must endeaver to correct his physical defects and do it quickly.

A SUGGESTED HEALTH PROGRAM

I wish to suggest, for this purpose, the following health program which should be possible to introduce in each school; a program which should provide, in addition to health education, health practices in school:

A special person, a matron, should be assigned to every development school to take care of the physical needs of the children. All who are nervous, all who have serious visual defects, all who are borderline tuberculosis cases or are tuberculosis contacts, and all who have heart defects should have a rest period daily, preferably in the open air.

All those who suffer from various forms of malnutrition, and do not have sufficient food at home, should receive lunch, milk, and cod-liver oil in school, also breakfast when possible.

In charge of this work a nutrition teacher is most desirable.

Corrective physical training should be given to all the children with postural defects and poor coordination. The exercises should be made interesting, not tiring, and given systematically. This type of physical education will tend to develop the capacity of the chest and thus improve the condition of the lungs and heart, and also train the muscles to better performance of manual work.

THREE CARDINAL ELEMENTS IN THE HEALTH PROGRAM

Nutrition, rest and corrective physical education are the three cardinal points of the health program which should be, and can be carried out in school. Such a program we have in one of these schools under the supervision of the matron. The children rest an hour daily and receive milk, lunch and cod-liver oil. Since September, 1936, twenty-eight children attended the rest class, twenty-four attend it at present.

The maximum gain in weight was 13½ pounds, the average gain was 5.2 pounds for those who attended the class for five months, and 1.7 per cent for those who attended the class for two months.

The physical condition and achievement in school improved in the majority of cases.

A more extensive program is carried on in another of these schools, under the supervision of one of the teachers and under the direction of the principal.

Some fifty-five children were assigned through the year, and thirteen of these children receive in school, breakfast, nutrition, and lunch, while nineteen receive nutrition, and twenty-four their breakfast. The maximum gain was twenty-five pounds, the average was 7.6 for those who receive breakfast, and 6.05 for the others.

The school physician should be given sufficient time for a thorough study of each child, and the school nurse should have time enough to follow up the cases.

The school should be able to offer to the children transportation to the clinics when the parents cannot take them. A "healthmobile" on the school premises is most desirable.

It is true that under this program not all defects can be corrected; it is true that even the correction cannot alter the mind of the child, but it is also true that the mentally-deficient child, when relieved from his physical handicap, can always find better application for his limited ability and once in a while may prove that he is not so dumb.

Mental deficiency cannot be cured, but can be made less disabling.

In conclusion I shall paraphase the quotation from Dickins which I have used as my theme and say:

"Try not to associate *mental* defects with bodily, my good friends, except for solid reasons, but when physical defects are found always correct them quickly."

649 South Olive Street.

DISCUSSION

ELLEN S. STADTMULLER, M.D. (Chief, Bureau of Child Hygiene, California Department of Public Health, San Francisco).—In a series of lectures delivered by Dr. L. Emmett Holt some years ago, in which the nutritional status of children was discussed, he pointed out that superior intellectual attainments and physical vigor usually go hand-in-hand. It is interesting to note that Doctor Goldwasser emphasizes the reverse picture in connection with mental defectives; that is, that the feeble-minded are usually also feeble-bodied, and are more susceptible to intercurrent disease. This may, of course, be due to the lessened vital resistance of the whole organism, but it may also be due to a lack of intelligent understanding of health rules and, where feeble-mindedness is a family problem, to a lack of intelligent care.

Although the following sentence is included, "This statement does not imply that the majority of mentally deficient children are born of mentally deficient parents," Doctor Goldwasser produces figures to show that, in many instances, one parent of these children may be mentally below par. She also shows the hereditary strain by figures which she cites of multiple instances of mental deficiency found in one family occurring in the group of children under consideration. The high incidence of glandular disorders found among this group is in line with the modern conception that internal secretions are a determining factor in the mental ability and competence of the organism.

In addition, 84 per cent of the 900 children reviewed show physical defects. These figures may be contrasted with those available for young California children in rural areas. According to examinations recently conducted by the staff of the Bureau of Child Hygiene, State Department of Public Health, 65.7 per cent of young children in public schools show physical defects. Among American migratory children recently studied in the San Joaquin Valley, 91.3 per cent of a young group, consisting of 197 children, showed defects. A large group of children surveyed in Pennsylvania during the year 1932 showed from 15 to 17 per cent suffering from malnutrition, even in counties where agriculture was the chief industry. A recent survey of 14,591 children given audiometer tests in the mountain counties of California showed 1,468, or slightly more than 10 per cent, with diminished hearing. Similarly, for the other physical defects cited, such as decayed teeth, diseased tonsils, and poor posture, the percentage in Doctor Goldwasser's group does not appear to be higher than those in any group of school children studied.

It is true that these children, being much less able to understand their own needs and much more difficult to educate, are in need of special protection; but, if good health supervision and corrective work were available for all children in the schools, good care for the mentally defective would be available as well.

There is this special point to be stressed in considering better physical conditions for such a group of children: By the investment of present sums in bettering their physical condition, we undoubtedly assist them to receive all the training which their mental capacity allows them to absorb, and by so doing we prevent the greater expense of dependency in future life.

SVEN LOKRANTZ, M.D. (858 Manning Avenue, Los Angeles).—Whatever the mental condition may be, the physical welfare of the child must be considered. Subnormal children who have physical defects should have these defects corrected, if possible, and thereby we may reduce the mental retardation.

I feel that the health program outlined above for our mentally handicapped boys and girls is very worth while and of greatest importance in our educational program for these mental defectives. Much is still to be learned about the correlation between health and mental fitness. The research done by Doctor Goldwasser is a fine step toward the promotion of health among our mentally retarded. It constitutes a challenge to physicians and educators everywhere to aid in making these health facilities obtainable to these subnormal children that they may enjoy greater comfort, be less a burden to society, and lessen the physical retardation superimposed on a dull mind.

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A. J. ROSANOFF, M.D. (1908 Wilshire Boulevard, Los Angeles).—Doctor Goldwasser's investigation has revealed that 1.9 per cent of the children enrolled in the elementary public schools of the city of Los Angeles are in the development schools. It may be judged that the true incidence of mental deficiency among children of elementary-school ages is higher than this figure would indicate; for not all mentally deficient children are sent to the development schools. The lowest-grade cases, especially if complicated with crippling palsies, epilepsy, etc., are necessarily excluded from the schools; many of the higher-grade cases are kept in the regular classes.

The investigation has revealed, further, that the children in the development schools are further handicapped, as a group, by an abnormally high incidence of physical defects, such as infected teeth and tonsils, poor general nutrition, impaired vision and hearing, and the like.

Such findings are not new either to physicians or to educators; but it is probably worth while to bring them to attention as problems existing today in our own community and calling for some such preventive and remedial measures as those suggested in the paper.

SKIN AND CHEMICAL TESTS FOR PREGNANCY*

By ROBERT D. DUNN, M.D.
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DISCUSSION *by Daniel G. Morton, M.D., San Francisco.*

OF the recent tests for pregnancy, the chemical method of Visscher and Bowman,[1] introduced in 1934, and the intradermal method described by Porges and Pollatschek,[2] in 1929, attracted our attention because of the ease with which these tests can be performed, and the small cost they entail to the patient. We, therefore, undertook to investigate the reliability of these tests to obtain first-hand information. Both have been reported elsewhere by us, and both have been given support by various observers, whose results we shall refer to later.

VISSCHER AND BOWMAN METHOD

Visscher and Bowman based their test on the presence of the gonadotropic hormone in the urine of pregnant women. The technique was carried out by us as follows: To one cubic centimeter of urine are added one drop of one per cent hydrogen peroxid, five drops of one per cent aqueous solution of phenylhydrazin hydrochlorid, five drops of five per cent aqueous solution of methyl cyanid, and five drops of concentrated hydrochloric acid. The mixture is put into a boiling-water bath for twenty-five minutes. A test positive for pregnancy shows a russet color and a flocculent precipitate, and a negative reaction shows a straw color either clear or with a powdery precipitate.

CLINICAL MATERIAL FOR THE TESTS

We have employed this test in 476 instances, divided into two series. The first included 250 late pregnancies, of which 212 gave a positive reaction, an accuracy of 84.8 per cent. Comparing the Visscher-Bowman method with Friedman tests in sixty-five early pregnancies, we found thirty-six positive chemical tests in forty-one positive "Friedman's," and twenty-one negative chemical tests in twenty-four negative "Friedman's," 87.6 per cent correct. Of nonpregnancy urines, 45.2 per cent showed false positive reactions. This large number of false positives occurred principally in febrile patients, and we assumed that these were due to an increase in catabolic substances in the urine. In this original series we noted that urines of low specific gravity (under 1.015) gave many false negative reactions, whereas in urines of higher concentration errors were less prone to occur. In the later series we discarded low specific gravity urines, hoping to reduce this error. In eighty-one late pregnancies, seventy-one (87.7 per cent) were correct. Eighteen positive Friedman tests included fourteen positive and four negative chemical tests, an accuracy of 77.8 per cent. These figures, although showing an improvement in the late pregnancies (87.7 per cent from 84.8 per cent), were less accurate in the early pregnancies (87.6 to 77.8 per cent). This indicated to us that the elimination of the apparent source of error (low specific gravity) did not influence to any great degree our original figures.

RESULTS NOTED IN THE STUDY

Our results are at considerable variance with those of the majority of other observers, who found the Visscher-Bowman test accurate in from 88 to 100 per cent of cases. The originators of this test found an accuracy of 93 per cent in known pregnancies, and 83 per cent in early pregnancies. In eighty-three patients investigated by Dolff,[3] 96 per cent of late pregnancies and 95 per cent of early pregnancies were correct. He was the first to call attention to false negatives in urines of low specific gravity, and false positives in febrile patients. Menken's[4] very small series gave correct reactions in 100 per cent of early pregnancies and 88 per cent of late pregnancies. Recent reports by Dodds,[5] Wiesener,[6] and Friedrich[7] credit the test with an accuracy of 90 per cent or better.

FINDINGS OF OTHER OBSERVERS

Sheehan,[8] in a very recent paper, reported a considerably lower percentage of accuracy (about 75 per cent) in a group of pregnancies. For com-

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